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Masakatsu SHIMIZU et al.

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For: METHOD OF AND APPARATUS FOR   Examiner: A.J.Rudy
     ESTIMATING PRODUCT COST

VERIFICATION OF TRANSLATION

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November 21, 2006

[Name of Document]   Specification

[Title of the Invention]

Method of and Apparatus for Estimating Product Cost

[What is Claimed is]

[Claim 1]   An apparatus for estimating the cost of a product, characterized in that

an input device for receiving an input action;

a cost calculation processor for calculating a manufacturing cost based on information inputted from said input device and cost factor data, supplied from an external source, for the calculation of the manufacturing cost; and

a display device for displaying a calculated result from said cost calculation processor;

said cost calculation processor being arranged to calculate manufacturing costs for respective process series when a plurality of different process series for one component are entered from said input device;

said display device being arranged to display the calculated manufacturing costs for the respective process series.

[Claim 2]   An apparatus for estimating the cost of a product according to claim 1, characterized in that

said cost calculation processor is arranged to

calculate manufacturing costs for respective processes of the process series; and

said display device is arranged to display the calculated manufacturing costs for the respective processes.

[Claim 3] A method of estimating the cost of a product using an apparatus for estimating the cost of a product according to claim 1 or 2, characterized in that

said cost factor data is read from a database connected through a network;

said database stores cost factor data entered from respective providers; and

said cost factor data stored in said database are updated by cost factor data entered by the providers through the network.

[Claim 4] A method of estimating the cost of a product, characterized by:

calculating and displaying manufacturing costs of products for respective providers based on information provided by an estimate seeker and cost factor data provided by a plurality of providers with respect to the information and stored in a database; and

browsing the provided information, browsing the cost factor data stored in said database, updating the

cost factor data stored in said database, and browsing

the displayed manufacturing costs through a network.

[Detailed Description of the Invention]

[0001]

[Technical Field to Which the Invention Pertains]

The present invention relates to a method of and

an apparatus for estimating the cost of a product, and

more particularly to a method of and an apparatus for

estimating the cost of a product to perform a cost

comparison in view of a cost varying factor of the

product whose cost is to be estimated and to determine

the cost of the product highly accurately and quickly.

[0002]

[Prior art]

In recent years there have known an apparatus for

estimating the cost of a product using a computer. For

example, Japanese Patent Laid-open No. Hei 9-160945

discloses an apparatus having a database for storing

estimation reference data and a cost element calculator

for calculating cost elements based on the estimation

reference data. The estimation reference data represent,

for example, material information of molded articles,

molding machine information, secondary processing

information, etc. Japanese Patent Laid-open No. Hei 9-

231265 discloses an apparatus for estimating a processing process from processing element information and product cost factor information, and calculating processing expenses based on the estimated processing process. The processing element information represents types of processing elements, the number of processing elements, the characteristics of processing elements, etc.

[0003]

In the disclosed apparatus, the material expenses and the costs of processing processes are stored in a database, and the cost of a product to be estimated is calculated by entering functional information of the product, or a processing process is estimated to increase the accuracy with which to calculate the cost of a product by entering processing element information.

[0004]

[Problem to be solved by the invention]

However, the conventional apparatus for estimating the cost of a product and methods of estimating the cost of a product using those apparatus has the following problems because the cost is calculated from the standpoint of a manufacturer (estimator) having a single manufacturing facility.

[0005]

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For manufacturing a certain component, the option is not limited to a single manufacturing method, but in general a plurality of manufacturing methods or apparatuses can be employed depending on the specifications of the product and the quantity thereof. Detailed configurations suitable for respective manufacturing methods and apparatus are thus available for one component. Accordingly, it is preferable to compare and review costs covering changes in detailed configurations with respect to the respective manufacturing methods and apparatus for designing a component.

[0006]

For example, for completing a certain component through a plurality of processing processes, it is preferable to compare and review a cost incurred by assigning a general-purpose processing machine to a plurality of processes and a cost incurred by introducing dedicated processing machines altogether to perform a plurality of processes. For comparing and reviewing the manufacture of a component within a company and the manufacture of a component outside of the company, it is preferable to compare and review costs that have been calculated taking into account manufacturing processes

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within and outside of the company.

[0007]

These reviews are not infrequent in daily operations, but are often carried out at the time of planning the startup of a process of mass-producing products. Even while components are being mass-produced, if the planned quantity of such components to be manufactured within the company is to be changed, then it is necessary to make the above comparison for the purpose of deciding whether a new investment for equipment is to be made or the job is to be farmed out.

[0008]

With the conventional apparatus for and methods of estimating the cost of a product, the process of comparing and reviewing costs according to different manufacturing facilities or methods or according to whether the product is to be manufactured within or outside of the company is time-consuming because information required to calculate the costs needs to be entered depending on the different manufacturing facilities or methods or whether the product is to be manufactured within or outside of the company.

[0009]

It is an object of the present invention to

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provide a method of and an apparatus for estimating the
cost of a product, which will solve the above problems
and are suitable for comparing and reviewing costs
according to different manufacturing facilities or
methods for a product or according to whether the product
is to be manufactured within or outside of the company.

[0010]

[Means for solving the problem]

In order to attain the object described above, in
accordance with a first feature of the present invention
there is provided an apparatus for estimating the cost of
a product, characterized in that an input device for
receiving an input action, a cost calculation processor
for calculating a manufacturing cost based on information
inputted from the input device and cost factor data,
supplied from an external source, for the calculation of
the manufacturing cost, and a display device for
displaying a calculated result from the cost calculation
processor, the cost calculation processor being arranged
to calculate manufacturing costs for respective process
series when a plurality of different process series for
one component are entered from the input device, the
display device being arranged to display the calculated
manufacturing costs for the respective process series.

[0011]

According to the first feature, since the manufacturing costs for the respective process series are calculated and displayed based on the information inputted from the input device and the cost factor data, the differences between the costs for the different process series can easily be compared with each other.

[0012]

In accordance with a second feature of the present invention, the cost calculation processor is arranged to calculate manufacturing costs for respective processes of the process series, and the display device is arranged to display the calculated manufacturing costs for the respective processes. According to the second feature, since elements making up the process series, i.e., costs for the respective processes, are displayed, factors for cost differences caused by the process series can easily be examined.

[0013]

In accordance with a third feature of the present invention, in a method of estimating the cost of a product using an apparatus for estimating the cost of a product according to the first or second feature, the cost factor data is read from a database connected

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through a network, the database stores cost factor data entered from respective providers, and the cost factor data stored in the database are updated by cost factor data entered by the providers through the network.

[0014]

According to the third feature, since manufacturing costs are calculated using cost factor data stored in the database that is updated by the cost factor data providers, costs can be compared based on latest cost factor data.

[0015]

In accordance with a fourth feature of the present invention, there is provided a method of estimating the cost of a product, characterized by calculating and displaying manufacturing costs of products for respective providers based on information provided by an estimate seeker and cost factor data provided by a plurality of providers with respect to the information and stored in a database, and browsing the provided information, browsing the cost factor data stored in the database, updating the cost factor data stored in the database, and browsing the displayed manufacturing costs through a network.

[0016]

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According to the fourth feature, cost factor data are provided through the network from the providers who have browsed the information provided by the estimate seeker, and a manufacturing cost is calculated based on the information and the cost factor data. Since the calculated manufacturing cost can be browsed by the providers through the network to update the cost factor data, the manufacturing cost can be calculated using the latest cost factor data that have been updated.

[0017]

[Mode for Carrying Out the Invention]

An embodiment of the present invention will be described below with reference to the drawings. FIG. 1 is a view showing a network including a cost estimating system according to the embodiment. In FIG. 1, a development department 10, a management department 11, a purchase department 12, and n production sites 13-1, 13-2, ···, 13-n (hereinafter collectively referred to as "internal production department 13") have respective information processing terminals such as personal computers or the like which have a function as a component cost estimating apparatus according to the present invention. These information processing terminals are connected to a network (hereinafter

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referred to as "in-house net") 100 such as a LAN, an

intranet, an extranet, etc.

[0018]

To the in-house network 100, there are connected

memory devices 14, 15 and 16 for storing data. The

memory device 14 stores information of products, that is,

shape data of components or the like, which are to be

estimated, supplied from the development department 10.

The memory device 15 (hereinafter referred to as

"manufacturing cost price database 15") stores

manufacturing cost prices as a fixed portion of cost

factors that determine product prices. The memory device

16 (hereinafter referred to as "variable cost database

16") stores variable cost factors including production

quantities, manufacturing methods, wage rates (wages per

process), etc. The memory device 14, the manufacturing

cost price database 15, and the variable cost database 16

can be realized as a database sharing function by known

groupware.

[0019]

The in-house net 100 can be connected to the

Internet 200. To the Internet 200, there are connected

information processing terminals of N component makers

17-1, 17-2, $\cdots$, 17-N (hereinafter collectively referred

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to as "component maker 17"). The information processing

terminals of these component makers 17 also have a

function as a component cost estimating apparatus

according to the present invention. The component makers

17 may be specialists in different fields, e.g., a

casting expert, a forging expert, a machining expert,

etc., or a plurality of specialists in one field.

[0020]

The manufacturing cost price database 15 and the

variable cost database 16 may not be connected to the in-

house net 100, but may be connected to the Internet 200.

The component makers 17 may be included in the in-house

net 100.

[0021]

FIG. 2 is a block diagram of the cost estimating

apparatus in each of the information processing terminals.

Those reference numerals in FIG. 2 which are identical to

those in FIG. 1 represent identical or equivalent parts.

In FIG. 2, an input device 1 comprises pointing devices

such as a keyboard, a mouse, etc., and an interface

device for receiving input actions made by these pointing

devices. The input device 1 is used to enter shape data

(drawing values) and manufacturing cost data of

components that are to be estimated, and cost factor data

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such as variable cost data, etc., and commands. The cost
factor data comprise data representing material costs,
production facility expenses, personnel expenses,
management expenses, etc. The input device 1 may include
a CAD device for entering shape data of components. A
display device 2 comprises a CRT or a liquid crystal
display unit, and is used to display an echo of an input
action made by the input device 1 and a processed result.
A memory unit 3 stores data required for data processing.

[0022]

A processor 4 comprises a display information
processor 41, an input information processor 42, a
manufacturing cost price element calculator 43, a
variable cost element calculator 44, a cost calculation
processor 45, and a calculated result display unit 46.
The display information processor 41 extracts information
required for estimation from drawing values, etc. entered
from the input device 1, and detects shapes and
dimensions of components. The input information
processor 42 receives information, other than the
information relative to shapes and dimensions of
components of the information required for estimation
from the input device 1, and processes the received
information. Processed results from the display

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information processor 41 and the input information

processor 42 are stored in the memory device 14.

[0023]

The manufacturing cost price element calculator

43 calculates manufacturing cost price elements based on

cost prices received from the manufacturing cost price

database 15 and dada processed by the display information

processor 41 and the input information processor 42. The

variable cost element calculator 44 calculates variable

cost elements based on variable cost factors received

from the variable cost database 16 and data processed by

the input information processor 42. The cost calculation

processor 45 adds manufacturing cost price elements

calculated by the manufacturing cost price element

calculator 43 and variable cost elements calculated by

the variable cost element calculator 44 into a cost total.

[0024]

Information processing terminals including the

input device 1 and the display device 2 may be installed

in a plurality of locations such as an estimation seeker

such as a designer or the like (the development

department 10), the internal production departments 13,

and the component makers 17 (hereinafter also referred to

as "manufacturers"). The information processing

terminals thus installed allow costs to be compared in

each manufacturing site at all times based on the latest

information.

[0025]

FIG. 3 is a view showing a system arrangement

including the above component cost estimating apparatus.

Shape data, etc. entered using the input device 1 in the

development department 10 are stored in the memory device

14. The purchase department 12, the internal production

departments 13, and the component makers 17 can read the

shape data, etc. stored in the memory device 14 through a

network such as the in-house net 100, the Internet 200,

or the like.

[0026]

As with the memory device 14, the manufacturing

cost price database 15 and the variable cost database 16

can also be accessed from the management department 11,

the purchase department 12, the internal production

departments 13, and the component makers 17 through a

network such as the in-house net 100, the Internet 200,

or the like. Particularly, the component makers 17 can

write data in the variable cost database 16 in order to

register and update variable costs.

[0027]

Each of the management department 11, the
purchase department 12, the internal production
departments 13, and the component makers 17 performs cost
estimating calculations based on the shape data, etc.
read from the memory device 14, the manufacturing cost
prices read from the manufacturing cost price database 15,
and the variable cost factors read from the variable cost
database 16. These departments and component makers make
estimates from their own standpoints, and the estimates
are stored in the manufacturing cost price database 15 or
the variable cost database 16. Since each of the
development, management, and purchase departments which
are estimate seekers makes an estimate from its own
standpoint, it can make a thorough estimate.

[0028]

It is preferable that the purchase department 12,
the internal production departments 13, and the component
makers 17 make an estimate for each component, and the
management department 11 make an estimate for a final
product based on the sum of the estimates for the
components. The purchase department 12 negotiates with
the component makers 17 based on its own estimates. If
the component makers 17 are able to change their own
estimates based on the results of the negotiations, then

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the component makers 17 update the data stored in the
manufacturing cost price database 15 or the variable cost
database 16.

[0029]

The development department 10 can retrieve
updated estimates and review changes in manufacturing
methods and shapes. The purchase department 12 and the
component makers 17 can further review the changes in
manufacturing methods and shapes, and update the data
stored in the manufacturing cost price database 15 or the
variable cost database 16.

[0030]

FIG. 4 is a flowchart showing an estimating
process that is carried out in the development department
10. The estimating process is performed in an
interactive fashion based on information displayed on the
display device 2. When the estimating process is started,
the display device 2 displays a request for the selection
of component characteristics. The operator selects one
of predetermined categories to which the characteristics
of a component to be estimated belong. For the
manufacture of motorcycles, the categories include, for
example, an engine-related field E which primarily
involves casting, forging, and machining operations, a

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frame-related field F which primarily involves pressing, sheet-metal working, resin molding, and casting operations, and a chassis-related field C which primarily involves similar operations, and an electric accessory-related field D which involves various different fabrication processes for various components.

[0031]

After component characteristics, i.e., a category, are selected in step S1, cost calculating systems for respective components are activated according to the selection in steps S2 through S5. The cost calculating systems for respective components calculate costs according to cost calculating processes for a plurality of prescribed process series. For example, cost tables may be established for the respective process series, and a cost may be retrieved by specifying a component and a process series. A process series refers to a series comprising a combination of process elements put in a sequence and representing a collection of processes required to complete a certain component.

[0032]

The cost tables that are established for the respective process series allow the operator to easily compare costs of the process series with each other. The

operator or the designer in the development department 10 can calculate more correct costs by not only displaying costs for respective process series on the display device 2, but also changing the drawings (shape data) depending on the process series. This is because components of one type produced by forging and machining, respectively, take different shapes including wall thicknesses, beveled states, etc.

[0033]

Furthermore, costs can be compared based on not only the difference between process series having different processing processes, but also the difference between the following process series. FIG. 5 is a diagram showing flow sequences of machining a cap with a boss according to a sequential process (series process) and machining a cap with a boss according to a single process (parallel process). The sequential process includes a succession of processes including a process (D1) for blanking a material P into a circular workpiece and marking the workpiece, a process (D2) of drawing the workpiece into a cup, a process (D3) of punching a central hole for a boss in the workpiece, a first burring process (D4) for finishing an inner circumferential surface of a boss, a second burring process (D5) for

finishing an inner circumferential surface of a hub, and

a process (D6) of drawing the workpiece to a finished

shape. When the material (rectangular flat plate) P is

charged into the process D1, it is machined and outputted

sequentially from process to process until it is

completed as a component.

[0034]

In the single process, the above processes D1

through D6 are not related to, but independent of, each

other. Semi-products independently machined in the

processes D1 through D6 are charged into following

processes until they are completed.

[0035]

In the above process series, the display device 2

may be arranged to display not only costs for the

respective process series, but also costs for the

respective processes (process elements) of the process

series. If the costs are different between the process

series based on the displayed costs for the process

elements, then a factor which has caused the cost

difference can easily be examined.

[0036]

An example of a comparison of costs due to a

shape change is shown in FIG. 6. In FIG. 6,

manufacturers MA, MB are two component makers 17 which
are specialized in different manufacturing methods or two
internal production departments 13 having different
production facility capabilities or personnel expenses.
Calculated costs C1 were based on drawings (initial
conceptual drawings) that are initially produced without
concern over the abilities of the manufacturers MA, MB.
The calculated cost C1 of the manufacturer MA was lower
than the calculated cost C1 of the manufacturer MB. The
development department 10 then applied a change a1 to the
shapes in order to match the abilities of the
manufacturers MA, MB, and produced drawings reflecting
the change a1. The resultant calculated cost C2 of the
manufacturer MB was lower than the calculated cost C2 of
the manufacturer MA. The development department 10
further applied a change a2 to the shapes, and produced
drawings reflecting the change a2. The resultant
calculated cost C3 of the manufacturer MA was lower than
the calculated cost C2 of the manufacturer MB.

[0037]

By displaying the calculated costs at the
respective stages of changing the shapes, the designer in
the development department 10 who has seen the displayed
costs can determine which manufacturer is better than the

other in each stage of design change. If changes can be
made up to the stage of the change a2, then an order
should be sent to the manufacturer MB. If changes can be
allowed only up to the stage of the change a1, then it is
preferable to send an order to the manufacturer MA.

[0038]

If the manufacturer MA or the manufacturer MB is
selected for outsourcing, then the purchase department 12
can independently negotiate with the manufacturer 13 at
each stage of design change, and can update the data of
its own in the databases 15, 16 based on the results of
the negotiation with the manufacturer MA or the
manufacturer MB. The development department 10 can
calculate an estimate based on the latest data.

[0039]

[Effect of the Invention]

As is apparent from the foregoing description,
according to the invention defined in claim 1, it is
possible to compare and review manufacturing costs
according to process series for one product, e.g.,
according to different manufacturing methods. According
to the invention defined in claim 2, it is possible to
analyze a factor responsible for the difference between
manufacturing costs according to a plurality of process

series.

[0040]

According to the invention defined in claim 3, since manufacturing costs are calculated using cost factor data stored in a database that has been updated by cost factor data providers, costs can be compared based on the latest cost factor data. For example, if the cost factor data providers are a plurality of makers or manufacturing sites, then variable factor data in each of the makers and manufacturing sites can be reflected in the manufacturing costs, and the costs according to the makers and manufacturing sites can be compared with each other and their appropriateness can be judged.

[0041]

According to the invention defined in claim 4, cost factor data are provided through a network from a plurality of providers who have browsed the information provided by an estimate seeker, and a manufacturing cost is calculated based on the information and the cost factor data. Since the calculated manufacturing cost can be browsed by the providers through the network to update the cost factor data, the manufacturing cost can be calculated using the latest cost factor data that have been updated. The providers of cost factor data, i.e., a

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plurality of makers, can be update the cost factor data

which they have provided, depending on the information

provided by the estimate seeker, it is possible to

calculate a highly accurate cost in a short period of

time depending on the information provided by the

estimate seeker.

[Brief Description of the Drawings]

[FIG. 1]

FIG. 1 is a view showing a network including a

cost estimating system according to an embodiment of the

present invention.

[FIG. 2]

FIG. 2 is a block diagram of the cost estimating

apparatus according to the embodiment of the present

invention.

[FIG. 3]

FIG. 3 is a view showing a system arrangement

including the cost estimating apparatus according to the

embodiment of the present invention.

[FIG. 4]

FIG. 4 is a flowchart showing an example of an

estimating process.

[FIG. 5]

FIG. 5 is a diagram showing an example of process

series.

[FIG. 6]

FIG. 6 is a view showing an example of a comparison of costs due to a shape change.

[Explanation of Reference Numerals]

1 … input device, 2 … display device, 4 … processor, 10 … development department, 13 … internal production department, 14 … memory device, 15 … manufacturing cost price database, 16 … variable cost database, 17 … component maker